TOSSABLE FLIER

BACKGROUND

Flying toys of various shapes and sizes have been a part of the toy industry for more than seventy-five years. Flying toys include: flying discs, model airplanes, boomerangs, kites and ring airfoils. Popularity of this type of toy arises from people's general fascination with flight and the joy of throwing something that flies.

Toy gliders were originally made from thin, light-weight wood, wood frames covered with flexible skin materials and later, polystyrene foam, such as that sold under the tradename Styrofoam. More recently, newer materials made from polystyrene foam, closed cell resin material and foam plastics have been used.

All previous toy gliders have one thing in common, they must be launched like a dart. Whether by hand, by spring, by rubber, or by air they must be propelled in a straight, forward (or upward) direction. Mechanical launchers were produced for two reasons, one is to provide a more powerful launch resulting in longer flights. The second reason is to give younger children, who do not have the dexterity to launch a glider, the ability to play with these toys.

SUMMARY

The above-discussed and other drawbacks and deficiencies of the prior art are overcome or alleviated by an aerodynamic toy that is launched by holding a part of the wing and tossing it like a flying disc. More specifically, A tossable toy flier having a first body portion that is generally flat extends along a first plane, the first body portion being of a single piece of material; a weight fixed to a nose portion of the first body portion adjacent said front end; and a second body portion being generally flat and extending along a second plane. The first plane and the second plane intersect along a line that extends longitudinally from said front end to a tail end of the first body portion. The second body portion comprises the tail and extends from a point behind a midpoint of the first body portion towards a rear end portion of the first body portion.

The above-discussed and other features and advantages of the present invention will be appreciated and understood by those skilled in the art from the following detailed description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the drawings, closely related figures have the same number but different alphabetic suffixes.

FIG. 1 is a perspective view of a tossable flier;

FIG. 2 is an exploded perspective view of the tossable flier of FIG. 1;

FIG. 3 is a perspective view of a first additional embodiment of a tossable flier;

FIG. 4 is a top plan view of the tossable flier of FIG. 3;

FIG. 5 is a side view of the tail section of the tossable flier of FIG. 3;

FIG. 6A is a side view of the tossable flier of FIG.3 showing the wing and horizontal tail control surfaces in the up positions;

FIG. 6B is a side view of the tossable flier of FIG. 3 showing the wing and horizontal tail control surfaces in the down positions;

FIG. 7A is a top plan view of the tail section of the tossable flier of FIG. 3 showing a left turn;

FIG. 7B is a top plan view of the tail section of the tossable flier of FIG. 3 showing a right turn;

FIG. 8 is a perspective view of a second additional embodiment of a tossable flier;

FIG. 9 is an exploded perspective view of the tossable flier of FIG. 8;

FIG. 10 is a perspective view of a third additional embodiment of a tossable flier;

FIG. 11 is a side view of the tossable flier of FIG. 10;

FIG. 12 is a perspective view of an additional embodiment of a canopy weight for a tossable flier;

FIG. 13 is a perspective view of an additional embodiment of a canopy weight for a tossable flier;

FIG. 14 is a perspective view of an additional embodiment of a canopy weight for a tossable flier;

FIG. 15 is a perspective view of an additional embodiment of a canopy weight for a tossable flier;

FIG. 16 is a perspective view of an additional embodiment of a canopy weight for a tossable flier;

FIG. 17 is an exploded view of a fourth additional embodiment of a tossable flier;

FIG. 18 is a side view of an additional embodiment of the vertical tail;

FIG. 19 is an exploded perspective view of a fifth additional embodiment of the tossable flier;

FIG. 20 is a cross section of the wing with an eyelet reinforced cavity;

FIG. 21 is an exploded perspective view of a sixth additional embodiment of a tossable flier; and

FIG. 22 is a perspective view of the sixth additional embodiment of a tossable flier.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

FIGS. 1 and 2 show a perspective and exploded view of a basic version of the tossable flier, respectively, the nose, wing, fuselage, and horizontal tail 22. The present tossable flier may be constructed from any number of materials that give suitable strength to the wings of the flier given the density and weight of the flier, e.g., plastics, foams, and combinations, without limitation. In one exemplary embodiment, the primary material is a polyolefin or polystyrene foam or an equivalent. In another embodiment, the flier is a single die cut piece of .25 inch (6 mm) thickness closed cell metallocene polyolefin foam or an equivalent. In another embodiment, Styrofoam and its equivalents are used. In another embodiment 1/8" Styrofoam is used. Additionally, combinations of the forgoing materials or equivalents may be used.

Additionally, the flier may be constructed by any suitable methods, cutting, molding, etc. In one exemplary embodiment, the flier is made from die cut foam. Printing, painting, laminating, silk screening or other means of applying color to the

material may be performed prior to die cutting. Stickers, either functional or decorative may be applied before or after die cutting. Holes 44 and 46 (FIG. 2), cutouts 34 and 36, tail cutout 38 and vertical tail 24 may be die cut simultaneously with the overall shape of the nose, wing, fuselage, and horizontal tail 22.

After die cutting and the removal of the cutout pieces, the vertical tail 24 may be attached by means of adhesive or heat welding. The first weight 26 and the second weight 28 may be inserted into forward first weight hole 44 and forward second weight hole 46. The top canopy cover 30 and the bottom canopy cover 32 may be attached by means of adhesive. In one exemplary embodiment, the top canopy cover 30 and the bottom canopy cover 32 is a plastic that is flexible, light weight and durable enough to contain the first weight 26 and the second weight 28 in place even in the event of forceful impacts on hard surfaces.

In the basic exemplary version depicted in FIGS. 1 and 2, the left outer wing 40 and the right outer wing 42 are attached to the left horizontal tail section 48 and the right horizontal tail section 50 with a left circular connection 52 and a right circular connection 54. The fuselage 56 connects to the front horizontal tail 58 and to the rear of the nose 60. While vertical tail 24 is shown as a single vertical tail in FIGS. 1 and 2, multiple tails could be incorporated. It should be noted that the basic version depicted in FIGS. 1 and 2 is one of many possible and viable alternate designs that can be made without departing from the spirit and scope of the invention. For example, the tossable flier may be designed without a fuselage, i.e., without any central portion connecting the nose and the tail, wherein the nose and tail are connected exclusively by the wing portions. Many other such modifications can readily be envisioned.

Unlike all previous toy gliders, the tossable flier is advantageously launched as one would throw a flying disc: To launch the tossable flier, either the left outer wing 40, or the right outer wing 42 may be held between the thumb and the index, middle, ring and pinky fingers. Right handed people might hold the tossable flier by the right outer wing 42 and position it on the left side of the body. Launching the flier may be done by rotating and extending the arm at the elbow in a quick, firm manner and releasing it at the end of the extension. One-piece construction or well joined pieces

of the wing, fuselage, horizontal tail section, and good durability of the materials facilitates throwing the flier in this manner.

The tossable flier can additionally be thrown in a forehand manner. Right-handed people might hold the tossable flier by the left outer wing 40 and position it on the right side of the body. Launching it may be done by rotating and extending the arm at the shoulder in a more straight line, snapping motion.

The tossable flier can additionally be thrown by holding it almost anywhere and tossing in almost any manner. The overall design, material, vertical tail 24, first weight 26 and second weight 28, each may play a part in facilitating the tossable flier's unique launch and flight capabilities.

FIGS. 3 through 7B show an alternative exemplary embodiment of a tossable flier. Specifically, the first alternative embodiment includes die cut control surfaces allowing the user to alter the flight by manipulating the control surfaces. FIG. 3 shows a perspective view of the assembled tossable flier with die cut control surfaces 62. The left wing chord 64 and the right wing chord 66 have been increased in size to accommodate left wing control surface 68 and right wing control surface 70. A vertical tail 72 with vertical tail control surface 73 replaces the vertical tail 24. Left horizontal tail control surface 74 and right horizontal tail control surface 76 have been incorporated into the design and die cutting of this additional embodiment. FIG. 4 shows a top plan view of the tossable flier with die cut control surfaces. FIG. 5 shows a side view of the vertical tail with control surface 72 with its vertical tail control surface 73. FIG. 6A is a side view of the tossable flier with die cut control surfaces showing the left wing control surface 68 and the left horizontal tail control surface 74 both in the up position. FIG. 6B is a side view of the tossable flier with die cut control surfaces showing the left wing control surface 68 and the left horizontal tail control surface 74 both in the down position. FIGS. 6A and 6B also show the use of a foam top canopy cover 78 and a foam bottom canopy cover 80. FIG. 7A is a partial top plan view showing the vertical tail with control surfaces 72 and the vertical tail control surface 73 in a left turn position. FIG. 7B is a partial top plan view showing the vertical tail with control surfaces 72 and the vertical tail control surface 73 in a right turn position.

Incorporating the control surfaces into the design and die cuts, as shown in this additional exemplary embodiment, allows for specific control of the flight path and behavior in flight of the tossable flier. Pressing any of the control surfaces into an up or down, right or left position prior to launch changes its flight characteristics for the subsequent flight.

FIGS. 8 and 9 show perspective and exploded views, respectively, of an exemplary tossable flier 82 with a tab and slot design. FIG. 9 shows the exploded perspective and individual parts of the tossable flier with tab and slot design. A vertical tail 86 with tab and slot design is inserted into the cutout 94 for vertical tail. A weight 90 (which may be any suitable material but is illustrated as a rubber ball) is inserted into a cutout 89 for ball 90 and a nose with ball trap 88, which is then inserted into a cutout 92 for ball trap 88 and ball 90.

Incorporating into the design and die cuts, the tab and slot features shown in this additional embodiment allows the manufacturer to distribute the finished product in an unassembled form. The customer would insert the rubber ball/weight 90 into the cutout 89 within the nose with ball trap 88. Next that assembly is inserted into the cutout 92, which effectively traps and contains the ball. The vertical tail with tab and slot design 86 may be flexed and inserted into the cutout 94 to complete the assembly.

FIGS. 10 and 11 show perspective and profile views, respectively, of an exemplary injection molded tossable flier 96 according to another embodiment. The injection molded method of manufacture allows several important features to be included. The first is an aerodynamically clean leading edge 98 from left wing tip 100 to right wing tip 102. A cambered left wing 104 and a cambered right wing 106 is illustrated. The vertical tail 108 is illustrated as an integral part of the tossable flier. A front weight 110 is also illustrated as manufactured into the injection molded tossable flier. Alternatively, an aperture (not shown) may be created for a weight/canopy (see FIGS.12-16) to be inserted after the injection molding process. FIG. 11 shows a side view with the slight camber 112 designed into the overall length of the tossable flier. A molded in weight 110 and the cambered left wing 104 are also shown in FIG. 11.

The injection molded tossable flier as shown in this additional exemplary embodiment would create great lift due to the cambered wings, leading edge and the overall slight camber. The result would be longer flights and improved flight characteristics. Because of the asymmetrical nature of the cambered design illustrated by the exemplary injection molded tossable flier 96, it would only fly one side up. The die cut versions fly either side up.

FIGS. 12 through 16 show additional exemplary embodiments of canopy weights. FIG. 12 shows a perspective view of an injection molded or milled foam ball with a weight 116 inside and a grooved cavity 114 to hold it in the tossable flier. FIG. 13 shows a perspective view of an injection molded or milled foam ball with a cylindrical weight 118 inside and a grooved cavity 120 to hold it in the tossable flier. FIG. 14 shows perspective view of an injection molded or milled foam teardrop shaped canopy with an upper weight 122 and a lower weight 124. A diamond shaped column 126 maintains the specific orientation of the canopy and a grooved cavity 128 holds it in the tossable flier. FIG. 15 shows a perspective view of an open cell, injection molded canopy with a grooved cavity 130 and a diamond shaped column 132 to hold it in the tossable flier. FIG. 16 shows a perspective view of an injection molded hollow teardrop shaped canopy with a bunghole 134, bung 136 and a grooved cavity 138 to hold it in the tossable flier.

These additional embodiments address the canopy weight part of the tossable flier. Making it removable allows different canopies for different conditions. A light weight may be used for no wind situations, a heavier weight for windy conditions.

FIGS. 12, 13 and 14 show variations using dense, durable foam. FIG. 15 shows an open cell version for a larger outdoor model, which is designed to be soaked with water as its weight. Catching this version will splash the person who catches this tossable flier with refreshing water on a hot day. FIG. 16 shows an injection molded plastic canopy that can be filled with water or sand, allowing specific adjustment of the weight for different conditions. Note that in any instance, the combination of cavity and weight can be combined using a dense material such as soft rubber.

FIG. 17 shows an exploded view of a fourth additional exemplary embodiment of a tossable flier that uses a die cut cavity 144 and die cut weight 142 in lieu of first

weight 26 and second weight 28 of FIGS. 1 and 2. The top canopy cover 30 and bottom canopy cover 32 are as in FIGS 1 and 2. Die cut tail cavity 148 engages the rounded shapes 150, 152 of vertical tail 146 for alignment, adhesive application and to expedite the assembly process. FIG. 18 shows a side view of vertical tail 146 and rounded shapes 150 and 152.

FIG. 19 shows an exploded view of a fifth additional embodiment of the tossable flier. Such embodiment is similar to that of FIG. 17 with the addition of exemplary cavities 154 and 156 (illustrated as die cut cavities, although the cavities may be formed by alternative methods), and four reinforcing members positioned at least partially within the cavities 154 and 156. In the illustrated embodiment, the reinforcement of the cavities is effected by eyelet/grommet elements. However, other structures or materials (resins, plastics, rubber, etc.) may be used where strengthening of the cavities is desired.

FIG. 20 illustrates a cross section of the right wing and cavity 154, and eyelets/grommets 158 and 160 assembled. A ribbon 165 is provided through the cavity 154. In one embodiment, ribbons 165 are provided in both wings. In another exemplary embodiment, the ribbons are of equal length. In another embodiment, the ribbons are tied with a bowline knot to prevent slippage.

In the embodiments incorporating ribbons 165, any of the tossable flier embodiments can be launched in a dynamic way by grasping one of the ends of the ribbons and twirling the flier above the head and then releasing the ribbon.

FIG. 21 shows an exploded perspective view of a sixth additional embodiment of a tossable flier that incorporates a slotted tail assembly 176 and an adhesive backed die cut weight 168.

FIG. 22 shows a perspective view of the tossable flier of FIG. 21 with scoring lines as follows: 178, 182 and 186 are the right side scoring that allow the right wing to be angled upwards. The left side scoring lines 180, 184 and 188 allow the left wing to be angled upwards. Angling the wings upwards helps stabilize the overall flight characteristics. Three scoring lines just ahead of the rear horizontal tail, 190, 192 and 194 allow the tail section to be adjusted upwards, which adjusts the height of the flight.

EXAMPLE

A exemplary tossable flier made in accordance with FIGS. 1 and 2 had the following specifications:

Indoor/Outdoor model:

Wingspan = 4 21/32"

Mean aerodynamic chord = 1 1/4"

Nose to tail (without vertical tail) = 7 3/8"

Nose to tail (with vertical tail) = 8 7/8"

Nose to weight = 29/32"

Horizontal tail width = 2 23/32"

Circular arm width = 15/32"

Wing angle (of attack) = 30 degrees

Center of gravity (from nose) = 2 5/16"

Weight (ball bearing) = 17.2234 grams

Ball bearing size = 3/8"

Material used:

Rogers Corporation, High Performance Foams (Division)

F-Cell 2.0 -- Closed-Cell Metallocene Polyolefin Foam

1/4" thickness

Density -- test method = ASTM D-3575

Units US = 2.0 PCF

Metric Units = 32 kg/m3

Outdoor model:

Wingspan = 7 7/16"

Mean aerodynamic chord = 2 1/16"

Nose to tail (without vertical tail) = 10 3/8"

Nose to tail (with vertical tail) = 13 1/8"

Nose to weight = 1 3/8"

Horizontal tail width = 4 1/4"
Circular arm width = 7/8"
Wing angle (of attack) = 30 degrees
Center of gravity (from nose) = 2 3/4"
Weight (ball bearing) = 78.7357 grams
Ball bearing size = 5/8"
Material used:
Stanlar Industries
100% Polyolefin
7/16" thickness

It was found that the tossable flier flew unexpectedly long distances when tossed firmly as previously discussed. The inventor believes that the aerodynamics of the tossable flier are more related to paper airplane aerodynamics than with the cambered wing aerodynamics of real or model airplanes. The fuselage is not vertically situated, its flat and on the same plane as the wing and horizontal tail. The nose weight is heavier than a conventional model glider, making the center of gravity substantially closer to the nose. The percentage of the distance to the center of gravity from the nose, verses the overall length of the tossable flier ranges from 20% to about 26%. The percentage of the distance to the center of gravity from the nose, verses the overall length of a conventional model glider ranges from 32% to more than 40%. The wingspan verses the nose to tail length (without the vertical tail) ratio is 0.63 for the tossable flier made in accordance with FIGS. 1 and 2, although ratios anywhere in the range from about 0.6 to 0.8 are preferred. Note that traditional toy gliders have a wingspan that is greater than the nose to tail length with a ratio of about 1.2. The die cut sections behind the wings, tail and connections from the wing tips to the tail are also important (but not necessary) elements. It is believed that the die cut sections act like slots on a light aircraft, or slats on a large aircraft, which are channels that allow air from under the wing to flow through the wing and merge with and energize the boundary layer on top of the wing, the result being to delay the stall. This makes for a longer and more stable flight for the tossable flier.

It could be that the flat leading edge and non-cambered wing produces a large pressure gradient at the leading edge, which aids transition to turbulent boundary layer, which in turn promotes vortex flow behind the leading edge on the upper surface. This forces air moving over the top surface to travel farther and faster, to meet up with air traveling under the wing and body/tail which creates differentials in pressure, which generates lift. Vortex lift increases exponentially with lift coefficient, so this could be why to achieve full flight performance, a strong quick toss may be preferable. Induced lift also seems to be a part of this equation. While these are the dynamics believed to be involved, the inventor does not wish to be bound by them.

Accordingly, the reader will see that the tossable flier achieves flight without the traditional dart type launch. It can be launched by children who do not have the dexterity to throw a traditional glider effectively. The tossable flier can be easily manufactured with a minimum of parts.

While the specifications provided in the descriptions represent an exemplification of one embodiment in each case, many designs, materials and scales are viable. For example, alternate embodiments such as an inflatable version for beach or pool. An extra large version made of nylon could be thrown, or used as a kite. A small version made of durable, flexible plastic with a rubber nose would make a shuttlecock that flies after struck with a racket. Glow in the dark material or paint could be used for night flights. Electronic lights could be incorporated with the battery assembly functioning as the weight canopy also for night or twilight flights. Sound producing components, either electronic or wind generated can also be used. The tossable flier could be designed to look like animals, monsters, spaceships, or logos. Molded canopy weights made of soft heavy foam could take the form of cartoon, movie, or any licensed characters. Launching aids could also be developed.

While exemplary embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Terms such as "first" and "second" as used herein are not intended to imply an order of importance or location, but merely to distinguish between one element and another of like kind. It is to be understood that the invention has been described by way of illustration only, and such illustrations and

embodiments have been disclosed herein are not to be construed as limiting to the claims.

What is claimed is:

5